an occlusion, bubble(s), or an empty or partially empty reservoir may be highly beneficial to the user's therapy and safety.

[0524] The precise determination of the volume of insulin delivered also effects the calibration of the system. Thus, having a precise measurement, the system may more accurately calibrate and thus, may determine unexpected results of integrity failure sooner.

[0525] Thus, various embodiments of the control loop include an actual volume and the trajectory volume. Where a system includes an actual volume that is closest to the trajectory volume, the estimate of plasma and ISG is closer to true. This may lead to more accurate insulin sensitivity determinations and calculations and more accurate predictive algorithms.

[0526] While the principles of the invention have been described herein, it is to be understood by those skilled in the art that this description is made only by way of example and not as a limitation as to the scope of the invention. Other embodiments are contemplated within the scope of the present invention in addition to the exemplary embodiments shown and described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention.

What is claimed is:

1. A system for at least partial closed-loop control of a medical condition, the system comprising:

at least one medical fluid pump for infusing fluid into a user, the at least one medical fluid pump comprising a sensor for determining the volume of fluid infused into the user by the at least one medical fluid pump, wherein the sensor is located a path to the user;

at least one continuous analyte monitor; and

a controller, the controller in communication with the medical fluid pump and the at least one continuous analyte monitor, the controller comprising a processor, the processor comprising instructions for delivery of medical fluid based at least on data received from the at least one continuous analyte monitor.

2. The system of claim **1** wherein the sensor further comprises an acoustic volume sensor.

3. The system of claim **1** further comprising a network operation center, the network operation center in communication with the processor.

4. The system of claim **1** further comprising a pumping chamber having an inlet connectable to provide fluid communication with a fluid source, and a pump outlet; and

a force application assembly adapted to provide a compressive stroke to the pumping chamber.

5. The system of claim **5** further comprising wherein the force application assembly is coupled to an inlet valve actuator and to a pump actuator, so that the compressive stroke actuates an inlet valve coupled between the inlet and the fluid source to close the valve when the pump actuator causes fluid to be urged from the pumping chamber to the pump outlet.

6. The system of claim **5** further comprising wherein the force application assembly comprises a motor for coordinated operation of the valve actuator and the pump actuator, wherein the motor includes at least one shape-memory actuator.

7. The system of claim **1** wherein at least one of the continuous analyte monitors is a continuous glucose monitor.

8. The system of claim **1** further comprising at least one accelerometer.

9. The system of claim **1** further comprising at least one blood oxygen sensor.

10. The system of claim **1** further comprising at least one inertial measurement unit comprising at least one accelerometer and at least one gyroscope.

11. The system of claim **1** further comprising at least one temperature sensor.

12. A system for at least partial closed-loop control of a medical condition, the system comprising:

at least one medical fluid pump for infusing fluid into a user, the at least one medical fluid pump comprising an acoustic volume sensor for determining the volume of fluid infused into the user by the at least one medical fluid pump, wherein the sensor is located a path to the user;

at least one continuous analyte monitor; and

a controller, the controller in communication with the medical fluid pump and the at least one continuous analyte monitor, the controller comprising a processor, the processor comprising instructions for delivery of medical fluid based at least on data received from the at least one continuous analyte monitor.

13. The system of claim **12** further comprising a network operation center, the network operation center in communication with the processor.

14. The system of claim **12** further comprising a pumping chamber having an inlet connectable to provide fluid communication with a fluid source, and a pump outlet.

15. The system of claim **14** further comprising a force application assembly adapted to provide a compressive stroke to the pumping chamber.

16. The system of claim **15** further comprising wherein the force application assembly is coupled to an inlet valve actuator and to a pump actuator, so that the compressive stroke actuates an inlet valve coupled between the inlet and the fluid source to close the valve when the pump actuator causes fluid to be urged from the pumping chamber to the pump outlet.

17. The system of claim **16** further comprising wherein the force application assembly comprises a motor for coordinated operation of the valve actuator and the pump actuator, wherein the motor includes at least one shape-memory actuator.

18. The system of claim **12** wherein at least one of the continuous analyte monitors is a continuous glucose monitor.

19. The system of claim **12** further comprising at least one accelerometer.

20. The system of claim **12** further comprising at least one blood oxygen sensor.

21. The system of claim **12** further comprising at least one inertial measurement unit comprising at least one accelerometer and at least one gyroscope.

22. The system of claim **12** further comprising at least one temperature sensor.

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